

Unit Planning Guide: Grade 9 Unit 4 of 8

Unit Title: Polynomials	Pacing (Duration of Unit): 5 weeks
Grade: 9	Buffer Day(s):

Desired Results

Transfer Goals

Students will be able to independently use their learning to:

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Established Goals (2011 MA Curriculum Frameworks Standards Incorporating the Common Core State Standards)

Standards (Priority Standards in bold):

- **A-APR-1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.**
- A-SSE-3c Use the properties of exponents to transform expressions for exponential functions. *For example, the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*
- **N-RN-1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.***
- **N-RN-2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.**
- **F-LE.1a Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal**

WiDA Standards (ELL)

Standard 1: ELLs **communicate** for **Social** and **Instructional** purposes within the school setting

Standard 3: ELLs **communicate** information, ideas and concepts necessary for academic success in the content area of **Mathematics**

In the lesson planning stage, teachers will need to differentiate lessons for ELLs. In order to accomplish this they will need: 1.) this curriculum map, 2.) a list of their ELLs and their proficiency levels, and 3.)

<p>intervals.</p> <ul style="list-style-type: none"> • F-LE.1c Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. • F-LE.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). 	<p>appropriate language function expectations and scaffolds or supports.</p> <p>To be completed in collaboration with the ELL Department</p>
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Meaning (*Mostly assessed through Performance Tasks/Assessments)

<p>Big Ideas: (Statements and concepts written in teacher friendly language which reflect the important [but not obvious] generalizations we want students to be able to arrive at. These are used by the teacher to focus daily instruction.)</p> <ul style="list-style-type: none"> • Know and apply properties of exponents • Rewrite expressions in radical form to rational exponents • Add, subtract, and multiply polynomials • Recognize situations in which data grows or decays exponentially 	<p>Essential Questions: (Questions which frame ongoing and important inquiries about the big ideas. They are written for students and used in daily instruction to help engage students in meaningful thinking.)</p> <ul style="list-style-type: none"> • How does the use of the adding, subtracting, multiplying and dividing rules change from integers to expressions with exponents? • What does it mean to have a negative or zero exponents? • What is the purpose or uses of scientific notation? • What are the characteristics of a polynomial?
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Acquisition (*Mostly assessed through traditional summative assessments)

Knowledge: Key basic concepts, facts, and key terms (written in phrases) students should be able to recall independently.

Students will know ...

- Properties of exponents
- Definition of scientific notation
- The conversion from radical form to rational exponents (ie. Nth root = to the power of $1/n$)
- Like terms
- Characteristics of the polynomial such as terms, degree, leading coefficient
- Rules for operations on polynomials (adding, subtracting, multiplying)
- How to translate between a verbal story, table, graph and equations for growth and decay functions

Skills: The discrete skills and process students should be able to use independently (Bloom's Level of Learning should be noted in parentheses.)

Students will be skilled at:

- Select an expression with two exponential terms, combining them by applying properties of exponents
- Select a number in standard form, writing the number in scientific notation
- Select a number in scientific notation, writing it in standard form
- Operations on numbers in scientific notation
- Identifying and combining like terms
- Describing a polynomial by its properties
- Select two polynomials, combining them by applying rule of adding, subtracting, and multiplying for polynomials
- Graphing growth and decay functions
- Solve exponential and decay to solve real world scenarios.